

**Controlling *Escherichia coli* O157:H7 in Fresh Beef Products**

**I. Pre-Harvest Research (Pre-harvest is defined as the time period prior to cattle being placed on the trailer for transport to the slaughter facility.)**

- Develop greater understanding of the ecology/epidemiology of *E. coli* O157:H7 as well as non-O157 Shiga-toxin producing *E. coli* (STEC).
- Determine the mechanism for intestinal colonization of *E. coli* O157:H7 and STEC and corresponding opportunities for control.

**II. Post-Harvest Research**

- Validate the critical components of the Beef Industry Food Safety Council's "Best Practices: Pathogen Control during Tenderizing/Enhancing of Whole Muscle Cuts" ([http://www.bifsc.org/uDocs/03\\_29\\_06%20Non-Intact%20Best%20Practices.pdf](http://www.bifsc.org/uDocs/03_29_06%20Non-Intact%20Best%20Practices.pdf), <http://www.bifsc.org/meetNon-IntactProductProcessingWorkshop.aspx>) by determining the cumulative effect of standard intervention practices including integrated lethality of cooking processes.
- Lairage has been identified as a risk factor for *E. coli* O157:H7 contamination of hides for cattle delivered to processing plants. Proposals should identify practical intervention technologies to reduce levels of *E. coli* O157:H7 at lairage.
- Identify and validate novel intervention technologies for *E. coli* O157:H7 and/or non-O157 shiga-toxin producing *E. coli* (STEC).
- Evaluate the effect of the plant environment (e.g. air, machinery, employees) in the role of transmission of *E. coli* O157:H7.
- Determine a novel method of reducing transfer of *E. coli* O157:H7 from hide to the carcass.
- Develop easy to adopt hide treatment technology to reduce *E. coli* O157:H7 load on cattle presented for harvest.
- Validate existing and commonly used intervention technologies for *E. coli* O157:H7 and/or non-O157 STEC.
- Evaluate the statistical validity of existing and alternative sampling methods for *E. coli* O157:H7 in beef trim and finished products.
- Identify and validate novel intervention technologies for *E. coli* O157:H7 in trim. The proposal should address the impact of the intervention on organoleptic properties and shelf-life.
- Develop a standard protocol for validating finished product sampling, specifically in ground beef.
- Examine the D-values for microorganisms in irradiated products. Are there differences between O157:H7 and non-O157:H7 STEC and/or gram-positive and negative microorganism?

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### **III. Information to Enhance Current and Future *E. coli* O157:H7 Risk Assessments**

- Address data needs identified in the FSIS Draft Risk Assessment for *E. coli* O157:H7.
- Conduct an analysis of the combination of virulence factors required to cause human illness.
- Develop data to support future risk assessments of *E. coli* O157:H7 and non-O157 shiga-toxin producing *E. coli* (STEC) and to estimate the human health risk attributable to beef products.

### **Controlling *Listeria monocytogenes* on Ready-to-Eat Meat and Poultry Products**

#### **I. Innovative Pathogen Intervention Technologies**

- Identify and validate bactericidal and/or bacteriostatic ingredients or treatments. Proposals should address existing FSIS and FDA regulations (*e.g.* FSIS Supplementary Guidance - [http://www.fsis.usda.gov/OPPDE/rdad/FRPubs/97-013F/Lm\\_Supplementary\\_Guidance.pdf](http://www.fsis.usda.gov/OPPDE/rdad/FRPubs/97-013F/Lm_Supplementary_Guidance.pdf), FDA approval status). Additionally, proposals should define the meaning of bacteriostatic and bacteriocidal in the context of existing regulations. Proposals should include an evaluation of the impact on sensory attributes, cost and application method.
- Identify factors involved in regulation of genes that influence the organism's ability to thrive in RTE processing environments, on food contact surfaces and/or on products. Identify potential synergistic effects of existing hurdles related to gene expression. Proposals should include an evaluation of differences among serotypes and impact of meat species type.

#### **II. Operational Control and Monitoring of the Processing Environment**

- Identify methods of preventing microbiological recontamination of sliced, diced, chopped and/or shredded meats.
- Validate the expected impact of operational controls such as clean room technologies, facility and equipment cleaning procedures.
- Develop and validate measures of effectiveness of existing controls. Proposals should address issues specific to small and very small plants.
- Evaluate real-time or near real-time *Listeria* sampling and testing technologies.
- Develop improved and validated quantitative methods for *L. monocytogenes* detection in foods and environmental samples.

#### **III. Post Production Research**

- Identify data gaps in the attribution of listeriosis cases related to distribution, retail and consumption of deli sliced meats, specifically meats sliced in retail delis.
- Identify and examine potential transmission and/or contamination vectors in a retail deli environment, including personnel and non-meat RTE deli products.
- Identify interventions to reduce the transmission and/or cross-contamination of *Lm* in the retail deli environment.

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## Controlling *Salmonella* in Meat and Poultry Products

### **I. Innovative Pathogen Intervention Technologies**

- Investigate and validate novel intervention technologies for *Salmonella* in meat and poultry products.
- Determine the effectiveness of existing or new intervention technologies on multiple serovars of *Salmonella* including those that are multi-drug resistant.
- Identify the potential for *Salmonella* harbors within the post-harvest processing environment and interventions to reduce or eliminate the presence of *Salmonella* in the identified harbors.
- Identify likely sources of contamination, risk factors, and how to systematically intervene at the production facility, during transportation and lairage and the levels of *Salmonella* present on carcasses and meat products.
- Identify interventions that can be applied to the pork carcass and/or trim to reduce the prevalence of *Salmonella* in pork trim. The intervention's impact on organoleptic properties should be evaluated.

### **II. Information to Enhance Current and Future *Salmonella* Public Health Risk Assessments**

- Develop cost-effective quantitative sampling and analytical methods for *Salmonella* on raw meat and poultry products that will provide meaningful data for enhancing public health.
- Investigate the epidemiology of multi-drug resistant *Salmonella* within the production chain and quantify the human health risks associated with these organisms.
- Identify the relationship between prevalence of *Salmonella* on pork carcasses with prevalence on pork trim and their relationship to human illness.

## Targeted Research

AMI member companies have identified very specific targeted research needs that will assist the industry in solving unique technical challenges within meat and poultry facilities. These targeted projects have been specifically suggested by AMI member companies and some detail concerning project scope has been provided. These projects will be considered for funding along with projects submitted for other research priority areas. In some cases, these targeted projects may overlap with the general research priority areas listed above. If you choose to submit a proposal to address one or more of these projects, please reference this intent in the pre-proposal.

**Validate existing and commonly used intervention technologies for *Listeria monocytogenes* and how they impact *Salmonella* survival in fully cooked ready-to-eat meat and poultry products.**

The proposal should address:

- Additives and ingredients; and
- Thermal processes.

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**Develop novel interventions to reduce the likelihood of *Salmonella* contamination in products that appear ready-to-eat but are not ready-to-eat (i.e. uncooked, breaded, boneless poultry products that also may be stuffed or filled, charmarked, or artificially colored).**

The proposal should:

- Address potential undercooking of products and how growth can be inhibited; and
- Evaluate the organoleptic properties of the intervention.

**Review Paper: Understanding Sodium Replacements from a Food Safety and Health Risk Assessment Perspective**

The proposal should include the following components:

- Review the use of sodium as food safety intervention;
- Evaluate the synergistic effects of sodium with currently approved food safety hurdles (i.e. GRAS);
- Identify the food safety risks associated with sodium alternatives (both by lower sodium levels and potential protective effects of sodium replacements);
- Assess human health risks due to changes in sodium/potassium homeostasis; and
- Evaluate the risks of reduced sodium or use of sodium replacements to targeted at-risk populations (e.g. dialysis, obesity, low blood pressure, etc).

**Improve and augment epidemiological data on food attribution for listeriosis, both sporadic and outbreak cases.**

The proposal should recognize the following assumptions:

- The Food and Drug Administration/Food Safety and Inspection Service *Listeria* Risk Assessment indicate ready-to-eat deli items are responsible for a majority of foodborne listeriosis cases in the U.S.
- USDA's Food Safety and Inspection Service data indicate the prevalence of *Listeria monocytogenes* on RTE meat and poultry products has been declining from 2.54% contamination rate in 1998 to 0.37% in 2007, while the Centers for Disease Control and Prevention 2006 FoodNet data indicate listeriosis cases only declined from 5 cases/million in 1996 to 2.9 cases/million in 2008. If a majority of the listeriosis cases are indeed caused by contaminated deli meats, a much more considerable decline of human listeriosis cases should have occurred over the last 10 years. Research is thus needed to understand the reason behind this apparent discrepancy between the risk assessment data and the FSIS and CDC data on food contamination with *L. monocytogenes* and human listeriosis cases in order to facilitate further targeted interventions to reduce human listeriosis cases.

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**White Paper on the Causes of Human Methicillin-Resistant *Staphylococcus aureus* (MRSA) from All Food and Non-food Vectors.**

The paper should include the following components:

- Summarize all historical data on MRSA and its relationship with animal and non-animal related infections;
- Evaluate hospital nosocomial MRSA infections;
- Evaluate worldwide understanding of MRSA infections and their sources; and
- Identify the data gaps, state how these gaps influence the understanding of MRSA, and propose tasks needed to close the gaps.

**White Paper on *C. difficile* as a Risk Associated with Animal Sources.**

The paper should include the following components:

- Summarize all historical data on *C. difficile* and its relationship with animal and non-animal related infections;
- Evaluate hospital nosocomial *C. difficile* infections;
- Evaluate worldwide understanding of *C. difficile* infections and their sources; and
- Identify the data gaps, state how these gaps influence the understanding of *C. difficile*, and propose tasks needed to close the gaps.

**White Paper Addressing Nutritional Benefits of Meat.** Meat is a nutrient dense food. The nutritional benefits of human consumption of meat make it an essential part of a healthy diet. Yet, critics of meat consumption disagree. This white paper should address the nutrition components – benefits and areas for limitation – of the consumption of meat compared to other meat types and non-meat products. Specifically, the paper should include the following:

*Meat vs. meat (ex. turkey vs. beef) and meat vs. non-meat comparison of:*

- Nutrient density
- Protein quality
- Glycemic response
- etc.

*Meat protein benefits for:*

- Bone Health
- Immunity
- Inflammation
- Aging/Muscle Wasting
- Cognition